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## RECENT AND FOSSIL UNIONACEA AND MUTELACEA (FRESHWATER BIVALVES) OF THE CARIBBEAN ISLANDS.

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ABSTRACT. Two species of Recent Unionacea occur in Pinar del Rio, the western-most province of Cuba; one is represented in the fossil record in the province of Habana. They belong to the genera found in North and Central America. One fossil Unionacea and two Recent Mutelacea, found in Trinidad, occur in South America.

### INTRODUCTION

In the Caribbean islands, freshwater mussels have been found only in Cuba (and possibly on the nearby Isle of Pines) and in Trinidad. The two Cuban species of Unionacea, *Nephronaias scamnata* (Morelet) and *Villosa gundlachi* (Dunker), are restricted to the streams of the mountainous Province of Pinar del Rio, in the western-most part of the island. The streams in which they occur flow into the Gulf of Mexico or the Caribbean. *Villosa gundlachi* was formerly regarded as a *Nephronaias*, but because it is sexually dimorphic and its shell is similar to that of *V. lienosa* (Conrad) of the Gulf Coastal and Appalachicolan regions of the United States, it is now placed in the same genus. *Nephronaias scamnata* is also found as a fossil in Habana province. The distribution of these genera in Cuba, usually attributed to fortuitous dispersal, may be the result of continental drift (cf. Rosen, 1976).

A single Unionacea, *Triplodon trinitaria* (Maury), an ancestral form of *T. corrugatus* (Lamarck), is found in Pliocene deposits in southwestern Trinidad and eastern Venezuela. The geological relationship of these areas is discussed by Liddle (1928). Two recent species of Mutelacea, *Anodontites leotaudi* (Guppy) and

*Mycetopoda siliquosa* (Spix) occur both in Trinidad and Venezuela. *Mycetopoda siliquosa*, which is widely distributed from Guatemala to northern Argentina, is reported from Trinidad for the first time.

Classification above genus is that of Parodiz and Bonetto (1963); genera are according to Haas (1969) except the concept of *Villosa*, which is based on Burch (1975).

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Special thanks are extended to Dr. Peter R. Bacon of the University of the West Indies, Trinidad, for specimens of *A. leotaudi* and *M. siliquosa*. Dr. Joseph Rosewater, National Museum of Natural History, and Dr. Juan J. Parodiz, Carnegie Museum, Pittsburgh, kindly made the collections in their charge available. Dr. Barry Roth, California Academy of Sciences, San Francisco, lent specimens, and Dr. Rosina Fechter, Zoologische Staatssammlung, Munich, kindly informed me that the types of *M. siliquosa* (Spix) are still extant. Thanks are also extended to Drs. Kenneth J. Boss and Juan J. Parodiz for reading the manuscript and especially to Drs. Ruth D. Turner and Arthur S. Merrill who made critical suggestions and revisions.

ABBREVIATIONS

AMNH – American Museum Natural History, New York
ANSP – Academy of Natural Sciences, Philadelphia, Pennsylvania
BMNH – British Museum (Natural History), London, England
CAS – California Academy of Sciences, San Francisco, California
CM – Carnegie Museum, Pittsburgh, Pennsylvania
MCZ – Museum of Comparative Zoology, Cambridge, Mass.
USNM – National Museum of Natural History, Washington, D.C.

## Superfamily UNIONACEA Fleming 1828

## Family UNIONIDAE Fleming 1828

## Subfamily UNIONINAE Fleming 1828

### Genus **Nephronaias** Fischer and Crosse

*Nephronaias* Fischer and Crosse 1893, Mission Sci. au Mexique, pt. 7, *2:* 556 (Type-species, *Unio plicatulus* Charpentier 1856, by monotypy).

*Description.* "Shell elliptical, biangulate behind, that of the male showing a tendency to become arcuate with age, the female usually having a posterior inflation and never arcuate; surface concentrically sculptured; [umbos] low, with faint, broken ridges, which show a tendency to fall into two rounded loops; pseudocardinals generally rather compressed, ragged; laterals obliquely ridged; [umbonal cavity] rather deep, dorsal muscle scars distinct, running in a line from the [umbonal] cavity downward and forward." (Simpson, 1914: 253).

*Remarks.* In this paper we are dealing only with the subgenus *Nephronaias* in which Haas (1969: 192–204) included 24 Central American and Cuban species.

**Nephronaias (Nephronaias) scamnata** (Morelet)
Plate 37, figs. 1–4; Plate 38, fig. 1

*Unio scamnatus* Morelet 1849. Testacea Novissima *1:* 30 ([Rio Las Pozas] Cacajajícara, [Pinar del Rio] Cuba; lectotype BMNH 1893.2.4.1976 labeled, "Rio Taco Taco [Pinar del Rio], Cuba," selected by Johnson 1971: 92, pl. 2, fig. 3); Martens 1900, Biologia Centrali Americana, Moll., p. 507.

*Unio proclinatus* Martens 1900. Biologia Centrali Americana, Moll., p. 508 (Rio Taco [Taco]; Gibara [Oriente Prov.], Cuba [erroneous]); and Pinar del Rio; Gundlach, in Museum Berolini [syntypes presumed to be in the Zoological Museum, Humbolt University (Berlin)].

*Unio calamitarum* Morelet 1849. Testacea Novissima *1:* 30 (rivulum Baluntiè, propre Palenqueanum vicum [Chiapas Prov.], Mexico [presumed erroneous]; lectotype BMNH 1893.2.4.2010 selected by Johnson 1971: 80, pl. 2, fig. 5).

*Unio calamitarum prolongata* Fischer and Crosse 1894. Mission Sci. au Mexique, pt. 7, *2:* 612, pl. 63, fig. 5, 5a (type locality as preceding entry [presumed erroneous], Morelet colln.; type not located in the BMNH [presumed lost]).

*Unio bitumen* Cooke. Vaughn 1919 [in] Carnegie Inst. Washington, pub. no. 219, p. 130, pl. 9, fig. 3 a-c, (Angela Elmira asphalt mine, near Bejucal [Habana Prov.], Cuba, Oligocene "?"; holotype USNM 167063).

*Nephronaias scamnata* (Morelet). Simpson 1900. Proc. U.S. Natl. Mus. 22; 595; Simpson 1914, Cat. Naiades *1:* 272; Aguayo

and Jaume 1947, Catalogo Moluscos de Cuba, no. 134; Haas 1969, Das Tierreich, pt. 88, p. 193.

*Elliptio (Nephronaias) scamnatus* (Morelet). Frierson 1927, Check List of North American Naiades, p. 34; Haas 1929, Senckenbergiana *11:* 328, figs. 4, 5.

*Description.* Shell usually of medium size, not often reaching over 80 mm in length. Outline long elliptical, valves rather solid, compressed, and inequilateral. Anterior end broadly and regularly rounded, posterior end less so. Ventral margin almost straight or slightly arcuate. Dorsal margin straight, ending in an indistinct angle with the gradually descending posterior margin. Hinge ligament long. Posterior ridge low, faint, generally double, often ending in a faint biangulation. Umbos low and sharp, located very anteriorly, and sculptured with fine, doubly-looped ridges.

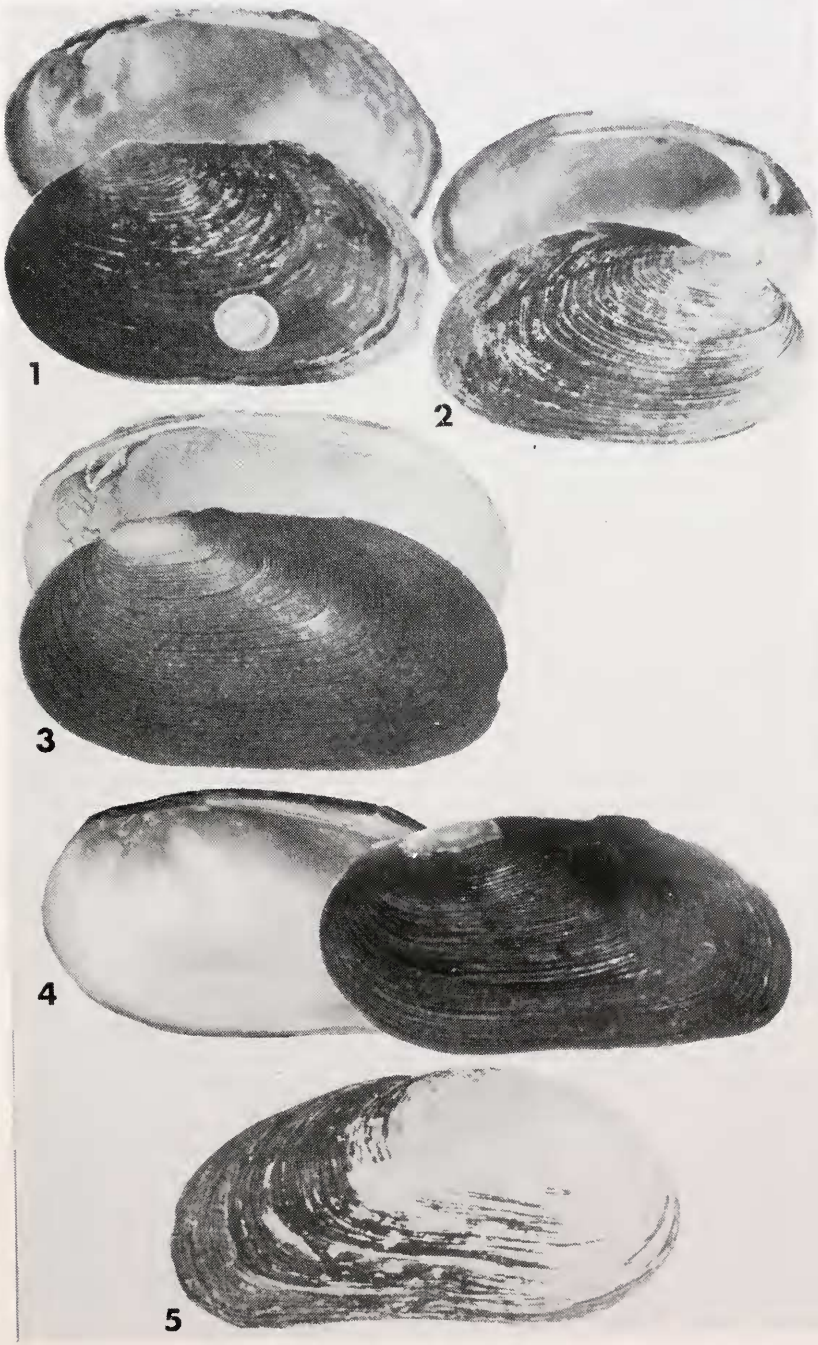
Shell with concentric sculpture covering the entire surface. Periostracum blackish, brownish, or olive, sometimes with a few faint green rays, and occasionally with concentric tawny or light brown bands.

Left valve with two subtriangular, ragged pseudocardinal teeth and two slender, nearly straight, lateral teeth. Right valve having a strong pseudocardinal tooth and a vestigial one anterior to it and a single lateral tooth. Umbonal cavities shallow. Anterior adductor muscle scars deep, posterior ones very faint. Pallial line distinct anteriorly, where the shell is thickened. Nacre usually bluish-white, creamy or yellowish and slightly iridescent posteriorly.

Sexual differences slight, but when apparent, male shells have a straight or slightly arcuate ventral margin, while females may be slightly produced at the posterior ventral margin.

Plate 37

Fig. 1. *Nephronaias (Nephronaias) scamnata* (Morelet). *Unio scamnatus* Morelet. Rio Taco Taco [Pinar del Rio Province] Cuba. Lectotype BMNH 1893.2.4.1976. Length 52, height 34, width 17 mm. Fig. 2. *Unio calamitarum* Morelet. Rio Baluntiè, near Palenque, [Chiapas State], Mexico, erroneous. [Pinar del Rio Province, Cuba]. Lectotype BMNH 1893.2.4.2010. Length 54, height 32, width 20 mm. Fig. 3. *Unio calamitarum prolongata* Fischer and Crosse. No locality given, but presumed to be the same as that of *U. calamitarum.* Figured type in the Morelet collection, according to Fischer and Crosse, but is not in the BMNH and so presumed lost. Figure from Fischer and Crosse. Length 64, height 34, width 22 mm. Fig. 4. Pinar del Rio Province, Cuba. MCZ 6585. Length 63, height 32, width 25 mm. Fig. 5. Rio Caiguanabo, San Diego de los Baños, Pinar del Rio Province, Cuba. MCZ 126800. Length 69, height 36, width 18 mm.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| Length mm | Height mm | Width mm | |
|---|---|---|---|
| 85 | 43 | 26 | Rio Taco Taco, Pinar del Rio Prov. Cuba. Female |
| 78 | 38 | 22 | Rio Viñales, Pinar del Rio Prov. Cuba. Male |

*Remarks. Nephronaias scamnata* (Morelet), judging by the size and number of lots found in the several collections studied, is not particularly abundant. Only a few lots have consisted of more than a half-dozen specimens. The species has sometimes been confused with male (but not female) *Villosa gundlachi* (Dunker), mostly because their ranges overlap. However, the shells of *N. scamnata* show little sexual dimorphism, are long elliptical, sometimes with a concave ventral margin, have the entire surface of the shell covered with concentric sculpture, and have ragged pseudocardinal teeth. The shells of male *V. gundlachi* are also elliptical but are proportionally much higher and have straight or slightly curved ventral margins, the concentric sculpture either restricted or absent, and the pseudocardinal teeth subcompressed.

This species has not been found in Central America; it bears no close resemblance to *Nephronaias hermanii* (Haas 1929: 30, figs. 12, 13) or *N. tabascoensis* (Charpentier) to which it has been compared. The sculpture of the former is not the same and the latter has a subtruncated posterior end. The lectotype of *Unio calamitarum* and the figure of *U. c. prolongata* are certainly *N. scamnata*, and as no other specimens have been seen from Central America, it is assumed that both taxa are based on Cuban shells from the Morelet collection. Recent *N. scamnata* and Oligocene (?) *U. bitumen* are separated by time, if not by locality but there is no significant morphological difference in their shells.

Aguayo and Jaume (1947) reported *N. scamnata* from Rio Zanjonal [near Viñales], but this river could not be located on the Cuban Military Maps of 1942; also it is impossible to tell which of the two Rio Hondos in Pinar del Rio Province they intended. They further reported this species from the Rio Santa Fé, Isla de Pinos, on the authority of Poey [reference not located], but they were unable to confirm this either by specimens in the Museo Poey or by collecting. Henderson (1916) did not find it when he made a survey of the land and freshwater mollusks of the island. Thus, the range is

restricted to Pinar del Rio Province, Cuba as far as can be ascertained.

*Specimens examined or recorded.* PINAR DEL RIO: *Gulf of Mexico Drainages*—Rio San Vicente, Viñales and Baños de San Vicente; Rio Rosario, Mina Constancia, Viñales; Rio Guacamayos, S of Concolacion del Norte (all MCZ); Rio Las Pozas, Cacarajícara (type locality of *U. scamnatus*); *Caribbean Drainages*—Rio Cuyaguateje, Sumidero and Guane; Rio Los Portales; Rio San Diego, Caiguanabo and San Diego de los Baños; Rio Taco Taco; Rio San Cristóbal, San Cristóbal (all MCZ). HABANA: Angela Elmira asphalt mine, near Bejucal, Oligocene (?) (type locality of *U. bitumen*); ISLA DE PINOS: Rio Santa Fe (Poey, teste Aguayo and Jaume, 1947) [doubtful].

## Subfamily LAMPSILINAE Ortmann 1910

### Genus **Villosa** Frierson

*Villosa* Frierson 1927, Check List of North American Naiades, pp. 11, 80. (Type-species, *Unio villosus* Wright 1898, by original designation).

*Description.* "The shells are small to medium in size and subrhomboidal, subovate or subelliptical in shape, and mostly rather thin. The disc is without sculpture, the periostracum greenish-yellow to nearly black, usually with dark green color rays. The [umbonal] sculpture is double-looped." (Burch, 1975: 124).

*Remarks.* Burch (1975: 22) included 16 North American species in *Villosa*. Based solely on shell morphology, *Unio gundlachi* from Cuba is herein also placed in this genus.

### **Villosa gundlachi** (Dunker)

Plate 38, figs. 2, 4

*Unio gundlachi* Dunker 1858, Malakozool. Blätter *5:* 228 ([Rio] Taco Taco [Pinar del Rio], Cuba): measured holotype in the Berlin Museum, *teste* Haas 1929: 328, and figs. 8–11, showing two female paratypes.

*Nephronaias gundlachi* (Dunker). Simpson 1900, Proc. U. S. Natl. Mus. *22:* 595; Simpson 1914, Cat. Naiades *1:* 274; Aguayo and Jaume 1947, Catalogo Moluscos de Cuba, no. 134, p. [1]; Haas, 1969, Das Tierreich, pt. 88, p. 193.

*Lampsilis (Actionaias) gundlachi* (Dunker). Frierson 1927, Check List of North American Naiades, p. 84.

*Elliptio (Nephronaias) gundlachi* (Dunker). Haas 1929, Senckenbergiana *11:* 328, figs. 6–11

*Description.* Shell usually of medium size, not often reaching over 70 mm in length. Outline elliptical or elliptical rhomboid. Valves rather solid, compressed, inequilateral. Anterior end regularly rounded, posterior end of the male slightly more broadly rounded, that of the female very much more broadly rounded. Ventral margin straight or slightly concave. Dorsal margin straight, ending in an indistinct angle with the posterior slope. Hinge ligament long. Posterior ridge low, faint, generally double, often ending in a faint biangulation. Umbos low, located very anteriorly, their sculpture consisting of doubly looped ridges.

Sculpture of faint, concentric ridges that are most distinct behind the posterior ridge. Periostracum smokey-olive to greenish yellow, occasionally with green rays on the disc.

Left valve with two subcompressed pseudocardinal teeth and two slender, nearly straight lateral teeth. Right valve with one subcompressed pseudocardinal, the vestige of a second one anteriorly, and one lateral tooth. Umbonal cavities shallow, with dorsal muscle scars in the cavities and under the pseudocardinal teeth. Anterior adductor muscle scars deep, posterior ones very faint. Pallial line distinct anteriorly, where the shell is thickened. Nacre whitish, or bluish-white, slightly iridescent posteriorly.

Plate 38

Fig. 1. *Nephronaias (Nephronaias) scamnata* (Morelet). *Unio bitumen* Cooke. Angela Elmira asphalt mine, near Bejucal [Habana Province], Cuba; Oligocene "?" Holotype USNM 167063. Figure from Cooke. Length 68, height 29.5 mm. **Fig. 2.** *Villosa gundlachi* (Dunker). *Unio gundlachi* Dunker. Rio Taco Taco [Pinar del Rio Province], Cuba. Paratype MCZ 94849, from W. Dunker ex J. G. Anthony collection. Length 53, height 32, width 12 mm. Male. **Fig. 3.** *Villosa lienosa* (Conrad). Bottom of lock 2, Black Warrior River, Tuscaloosa, Tuscaloosa Co., Alabama. Length 55, height 32, width 20 mm. Male. **Fig. 4.** *Villosa gundlachi* (Dunker). [Rio Guamá], near Pinar del Rio, Pinar del Rio Province, Cuba. MCZ 20862. Length 54, height 34, width 21 mm. Female. **Fig. 5.** *Villosa lienosa* (Conrad). Bottom of lock 2, Black Warrior River, Tuscaloosa, Tuscaloosa Co., Alabama, MCZ 28460. Length 48, height 32, width 18 mm. Female.


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Male shells quite evenly elliptical, length usually about one and one half times the height, the ventral margin straight, or slightly curved. Female shells much wider posteriorly than anteriorly, with a wide, rounded, marsupial swelling. The posterior point is high on the shell, and sharper than that of the male; below the point the posterior margin is subtruncate.

| Length mm | Height mm | Width mm | |
|---|---|---|---|
| 68 | 38 | 22 | Rio Cuyaguateje, Cabezas, Pinar del Rio Prov., Cuba. Male. |
| 62 | 36 | 20 | Rio Taco Taco, Pinar del Rio Prov. Cuba. Holotype. Male. |
| 62 | 42 | 24 | Rio Guamá, near Pinar del Rio, Pinar del Rio Prov., Cuba. Female. |
| 54 | 34 | 21 | As above. Female. |

*Remarks.* The male shell of *Villosa gundlachi* (Dunker) bears some superficial resemblance to *Nephronaias scamnata* (Morelet). However, the female of *V. gundlachi,* on the basis of shell morphology, is close to *V. lienosa* (Conrad), a common species in the Gulf Coastal and Appalachicolan regions of the United States. Simpson (1914: 273) noted the resemblance of the female *V. gundlachi* to *Lampsilis [=Ligumia] subrostrata* (Say). In each of these species, the female shell is much wider posteriorly than anteriorly, has a wide rounded marsupial swelling, a posterior point that is higher than on the male shell, and is subtruncate between the point and the post-basal swelling.

The range of *Villosa gundlachi* is limited to Pinar del Rio Province, Cuba. It is apparently rather rare as only a few of the lots examined have consisted of more than a half-dozen specimens.

*Specimens examined or recorded.* PINAR DEL RIO: *Gulf of Mexico Drainages*—Rio Las Pozas, near Rancho Lucas (MCZ) and Las Pozas (Aguayo and Jaume). *Caribbean Drainages*—Rio Cuyaguateje, Sumidero and Cabezas; and Rio Guamá, near Pinar del Rio (all MCZ). *Rio San Diego Drainage*—Rio San Diego, Caiguanabo and San Diego de los Baños (both MCZ); *Rio Los Palacios Drainage*—Rio Los Palacios, Pinar del Rio (MCZ). *Rio Taco Taco Drainage*—Rio Taco Taco, Taco Taco (MCZ, type locality of *U. gundlachi). Rio San Cristóbal Drainage*—Rio San Cristóbal, San Cristóbal (MCZ).

Family HYRIIDAE Swainson 1840
Subfamily HYRIINAE Ortmann 1911
Genus **Triplodon** Spix

*Triplodon* Spix 1827, [in] Spix and Wagner, Testacea Fluviatilia ... Brasiliam, Monachii [Munich], p. 53. (Type-species, *Triplodon rugosum* Spix 1827, by monotypy).

*Description.* Shell subrhomboidal, solid, slightly inflated, narrow and dorsally winged anteriorly, biangulate posteriorly. Umbos low with nearly radial sculpture. Periostracum greenish, to brownish or blackish. Two denticulate pseudocardinals in each valve, one lateral in the right and two in the left valve.

*Remarks.* The subgenus *Triplodon* s.s. has a well developed posterodorsal wing, while in the subgenus *Triquetrana* Simpson 1900 it is compressed and poorly developed. According to Haas (1969: 545), the former subgenus is represented by four recent species: *T. (T.) corrugatus* (Lamarck, 1819); *T. (T.) latialatus* (Sowerby 1869); *T. (T.) transversus* (Hupé 1857); and *T. (T.) rugosissimus* (Sowerby 1869). These species are found primarily in the Guayanas and Brasil. The fossil forms were discussed by Palmer (1945: 11); one of these, *T. (T.) trinitaria*, occurs in both Trinidad and Venezuela and is included here.

**Triplodon (Triplodon) trinitaria** (Maury)
Plate 39, fig. 1

*Hyria (Hyria) trinitaria* Maury 1925, Bull. American Paleontol. *10* (42): 235, pl. 13, figs. 2 (Cedros Point, SW Trinidad, Lower Pliocene, figured holotype Paleontological Research Institution 854); Palmer 1945, Bull. American Paleontol. *31*(118): 12, pl. 1, figs. 1–10.

*Description.* "Length of shell, without the anterior and posterior points, 65 mm. Shell subrhomboidal, rather solid, only slightly inflated, when perfect with a narrow, conspicuous, pointed, anterior process and a broad, high posterior dorsal wing terminating when entire in a prominent point. Posterior ridge strongly carinate, slightly biangulate. Beaks very low. Hinge line almost perfectly straight. One specimen shows distinctly a pseudocardinal tooth much split up into denticles. Surface marked with close, sharply defined, concentric threads, and on the disc, in front of the umbonal carina, are very beautiful V-shaped markings ..." (Maury, 1925).

| Length mm | Height mm | Width mm | |
|---|---|---|---|
| 70 | 40 | 21 | E La Llanera, State of Monagas, Venezuela, Lower Pliocene. |
| 65 | 50 | 32 | Cedros Point, SW Trinidad, Lower Pliocene. Holotype. |

*Remarks.* Maury (1925: 236) mentioned that *Triplodon trinitaria* Maury is ancestral to *T. corrugatus* (Lamarck 1819), in showing the "dawning" of the V-shaped corrugations which are so striking in *T. corrugatus.* The latter species is found in the rivers of the Guayanas, Brazil, and, based on a specimen so labeled in the Museum of Comparative Zoology, possibly also in the Orinoco River, Venezuela. Palmer (1945: 12) reported *T. trinitaria* from the lower Pliocene of Venezuela proper and noted that the assemblage of species from La Llanera suggests closer affinities with Amazonian and Recent forms than with Colombian species of the same genus.

*Triplodon trinitaria* is from the lower Pliocene of northeastern Venezuela and Trinidad. It is a rare species, known from about 40 specimens.

*Specimens examined or recorded.* VENEZUELA: a low hill along the east bank of the Quatatal River, east of La Llanera, and 17.1 kms N of Caicara, State of Monagas; Pliocene (Palmer, 1945: 7). TRINIDAD: Cedros Point, [SW part of island]; lower Pliocene (Maury, 1925: 236).

## Superfamily MUTELACEA Parodiz and Bonetto 1963
## Family MYCETOPODIDAE Parodiz and Bonetto 1963
## Subfamily ANODONTITINAE Parodiz and Bonetto 1963
### Genus **Anodontites** Bruguière

*Anodontites* Bruguière 1792, Jour. Hist. Nat., Paris *1:* 131. (Type-species, *Anodontites crispata* Bruguière, by monotypy). Haas (1969: 557) listed a number of generic synonyms.

*Description.* "Shell rounded to elongated, inflated, subsolid; [umbos] full, [periostracum] smooth or cloth-like, rarely having faint rays; hinge line straight or slightly curved, edentulous, sometimes a little sinuous, the escutcheon distinct and large; nacre

soft tinted, the prismatic border wide and well defined." (Simpson, 1914: 1403).

*Remarks.* Haas (1969: 572–574) recognized two additional subgenera, *Ruganodontites* Marshall 1931, and *Lamproscapha* Swainson 1840.

Subgenus **Anodontites** s.s.

*Description.* Shell rounded to elliptical; posterior ridge low or absent.

*Remarks.* Haas (1969: 558–572) included 19 species in this subgenus and a number of nominal subspecies.

**Anodontites (Anodontites) leotaudi** (Guppy)
Plate 39, figs. 2–3

*Anodon leotaudi* Guppy 1866, Annals and the Magazine of Nat. Hist. (3) *17:* 54 (streams flowing into the Caroni River, Trinidad, lectotype ANSP 125443, selected by Johnson and Baker, 1973, *125:* 160, pl. 10, fig. 3; paralectotype BMNH 1861.1.3.1.

*Anodontites irisans* Marshall 1926, Proc. U. S. Natl. Mus. *69:* 10, pl. 2, figs. 3, 5; pl. 3, fig. 7 (Venezuela; holotype USNM 359920; one lot of five specimens CAS 5825 (originally in the Stanford collection). Marshall saw one of these shells but sent it back to Stanford without measuring it, so a paratype in the lot cannot be determined.

*Glabaris leotaudi* (Guppy). Simpson, 1900, Proc. U. S. Natl. Mus. *22:* 929.

*Anodontites leotaudi* (Guppy). Simpson, 1914, Cat. Naiades, *3:* 1413.

*Anodontites (Anodontites) patagonicus leotaudi* (Guppy). Haas, 1969, Das Tierreich, pt. 88, p. 567.

*Description.* Shell of medium size, seldom exceeding 80 mm in length. Outline rather obovate. Valves rather thin and compressed. Anterior end regularly rounded, posterior end slightly produced near the base. Ventral margin almost straight. Dorsal margin slightly curved, forming an indistinct angle with the curved, and obliquely descending posterior margin. Hinge ligament short. Posterior ridge rounded and indistinct, though perceptibly double and ending in a slight biangulation in some specimens. Umbos rather full, only slightly elevated above the hinge line, their sculpture unknown. Surface of the shell smooth, sometimes satiny,

especially posteriorly. Periostracum yellowish brown, chestnut, or blackish.

Hinge plate and teeth lacking; umbonal cavities shallow; anterior muscle scars distinct, posterior scars and pallial line indistinct, nacre flesh colored, pinkish or whitish.

| Length mm | Height mm | Width mm | |
|---|---|---|---|
| 84 | 46 | 31 | [Caroni River], Trinidad. Measured type of *Anodon leotaudi* Guppy. |
| 70 | 39 | 22 | Venezuela. Holotype of *Anodontites irisans* Marshall. |
| 78 | 45 | 25 | Trinidad. Lectotype of *Anodon leotaudi* Guppy. |

*Remarks. Anodontites leotaudi* (Guppy) was placed near *A. patagonicus* (Lamarck) by Simpson (1914) and Haas (1969); however, it does not resemble it. The shell of *A. patagonicus* is obovate, more inflated, and heavier than that of *A. leotaudi* and its northern range is southern Brazil. *Anodontites leotaudi* appears close to some specimens of *A. trapesialis glaucus* (Valenciennes) which ranges from Central America south to the Magdalena River system, Colombia. However, the shell of *A. leotaudi* is heavier, the periostracum darker and without traces of green.

*Anodontites leotaudi* has been found in Venezuela and Trinidad. Guppy (1893: 230) gave an indication of its relative abundance: "I have never been able to procure more than two or three specimens."

*Specimens examined or recorded.* VENEZUELA: (Marshall; USNM: CAS; AMNH). TRINIDAD: (USNM); *Caroni River system:* "... some of the streams flowing into the Caroni." (Guppy 1866b: 27; ANSP; BMNH). *Nariva Swamp:* Cuche River (MCZ). *Lizard Springs:* 10 mi S E [town of] Rio Claro (MCZ).

## Subfamily MYCETOPODINAE Modell 1942

### Genus **Mycetopoda** Spix

*Mycetopoda* Orbigny 1835, Magasin de Zoologie, Paris *5* (5): 41 (type-species, *Anodontis siliquosi [sic]* Spix 1827, subsequent designation, Herrmannsen, 1847: 77).

*Description.* Shell thin, elongated, truncated posteriorly; posterior ridge low and flat; umbos smooth or slightly concen-

trically wrinkled; periostracum smooth, shining, pale greenish-yellow or brownish, rayless; hinge line straight and edentulous; nacre bluish white and iridescent; muscle scars shallow.

*Remarks.* Haas (1969: 574–576) included three species in this genus: *Mycetopoda siliquosa* (Spix), found from Guatemala to the La Plata River, Buenos Aires Province, Argentina; *M. soleniformis* Orbigny found from the headwaters of the Amazon River in Ecuador, Peru, Bolivia and Brazil to the Rio Paragua and Paraná drainages, Argentina (but not found in the Uruguay and La Plata Rivers, J. J. Parodiz, pers. comm.); and *M. legumen* (Martens) found from southern Brazil to the Rio de la Plata system, Uruguay and Argentina. The uniqueness of *M. legumen* is questioned here (see under Remarks for *M. siliquosa).*

**Mycetopoda siliquosa** (Spix)
Plate 39, fig. 4

*Anodon siliquosus* Spix 1827, [in] Spix and Wagner, Testacea Fluviatilia ... Brasiliam, Monachii [Munich], p. 30, pl. 23, fig. 2 (flumine Peruaguacú, ad molendinam sacchari Engenho da Ponte, in Provincia Bahiensi [Brazil]; figured type in the Bavarian State Museum, Munich, studied by Ihering (1890: 128), still extant, pers. comm. R. Fechter, 1980 [not seen]).

*Mycetopus weddellii* Hupé 1855, [in] Castelnau, Expedition ... L'Amerique de Sud ... Pt. 7, p. 93, pl. 20, fig. 2 (Santa-Anna de Chiquitos, Bresil, figured type, Paris Museum [not seen]).

*Mycetopoda siliquosa* (Spix). Simpson, 1900, Proc. U. S. Natl. Mus. *22:* 934; 1914, Cat. Naiades, *3:* 1459. Ortmann, 1921, Mem. Carnegie Mus. *8:* 633. Haas (1969: 574), with the exception of *M. clessini* Ihering 1893, included the following taxa in the synonymy of *M. siliquosa* (Spix 1827): *Mycetopus ventricosus* Orbigny 1846; *M. subsinuatus* Sowerby 1868; *M. hupeanus* Clessin 1875; *M. occidentalis* Clessin 1879; *M. staudingeri* Ihering 1890; *M. punctatus* Preston 1909; *Mycetopoda krausei* Ihering 1910; *M. staudingeri aequatorialis* Ihering 1910; *M. bahia* Ihering 1910; *M. orbignyi* Ihering 1910; *M. pittieri* Marshall 1927.

*Description.* Shell usually of medium size, though sometimes exceeding 130 mm in length. Outline elongate subtrapezoid. Valves thin and inflated, gaping at the anterior base. Anterior end regularly rounded, posterior end more broadly and less regularly rounded. Ventral margin long and usually straight. Dorsal margin long,

straight and forming a sharp angle with the obliquely truncate posterior margin. Hinge ligament long. Posterior ridge well developed, and narrowly rounded, ending in a blunt point at the base of the shell. Umbos moderately full, but not much elevated above the hinge line, located very anteriorly, their sculpture not known.

Surface usually shining, smooth except for growth lines and inconspicuous radial sculpture; periostracum pale greenish-yellow or brownish, rayless.

Hinge edentulous, or showing faint traces of denticles beneath the nacre; umbonal cavities shallow; muscle scars and pallial line faint. Nacre bluish white and iridescent.

| Length mm | Height mm | Width mm | |
|---|---|---|---|
| 145 | 46 | 31 | Peperpot Plantation near Paramaribo, Surinam |
| 99 | 33 | 19 | Nariva Swamp, Trinidad |

*Remarks. Mycetopoda siliquosa* (Spix) is a variable and widely distributed species. It has been confused with *M. soleniformis* (Orbigny) which has a concave ventral margin and a swollen posterior ridge, but the posterior ridge of *M. siliquosa* is not swollen and its ventral margin is straight.

Bonetto (1962: 180) and Haas (1969: 576) recognized *M. legumen* (Martens) as a mycetopod, though the type had not been figured, and included *M. felipponei* Marshall as a synonym. Mansur and Veitenheimer-Mendes (1979) redescribed *M. legumen*, figured the holotype, and restricted the type locality to: Arroio da Manteiga [city of] São Leopoldo, Rio Grande do Sul [Province], Brazil. They also included *M. felipponei* as a synonym, since it falls within the range of *M. legumen* which is, roughly, the lower Rio de la Plata,

Plate 39

**Fig. 1.** *Triplodon (Triplodon) trinitaria* (Maury). *Hyria (Hyria) trinitaria* Maury. Cedros Point, SW Trinidad, Holotype Paleo. Res. Inst. 854. Length 65, height 50, width 32 mm. **Fig. 2.** *Anodontites (Anodontites) leotaudi* (Guppy). *Unio leotaudi* Guppy. Streams flowing into the Caroni [River], Trinidad. Lectotype ANSP 125443. Length 78, height 45, width 25 mm. **Fig. 3.** *A. (A.) leotaudi* Cuche River, Nariva Swamp, Trinidad. MCZ 288542. Length 62, height 38, width 22 mm. **Fig. 4.** *Mycetopoda siliquosa* (Spix) Canque River, Nariva Swamp, Trinidad. MCZ 88541. Length 87, height 32, width 18 mm.


1
2
3
4

Rio Uruguay, and the rivers flowing into the Atlantic east of the Rio Uruguay. While the validity of *M. legumen* is not of essential concern here, both *M. legumen* and *M. felipponei*, each with a straight ventral margin, appear to be *M. siliquosa*. The morphological shell variation of *M. legumen*, illustrated by Mansur and Veitenheimer-Mendes (1979, fig. 5), is so similar to that of *M. siliquosa* over the rest of its range that I am at a loss to separate them conchologically, although the authors appear able to do so on the basis of the anatomy.

*Mycetopoda siliquosa* is a well established species ranging from Guatemala to northern Argentina, and Trinidad.

*Specimens examined or recorded.* GUATEMALA: Rio Conchins, Maya Farm, Quirigua, Izabel Prov. (CM); Paso Antonio [14°03'N; 90°43'W], Santa Rosa Prov. (Martens, 1900: 540). NICARAGUA: Lake Nicaragua (MCZ). COLOMBIA: Rio Chenche, Tulima Prov. (type locality of *M. punctatus)*. [Rio Bogota], Bogota, Cundinamarca Prov. (type locality of *M. subsinuatus)*. VENEZUELA: *Rio Portuguesa Drainage*—Rio Portuguesa, Mata Verde, near Guanare, Zamora Prov. (type locality of *M. pittieri)*. TRINIDAD: Nariva Swamp, Canque River (P. R. Bacon, 1978, MCZ). SURINAM: [Surinam River] Peperpot Plantation, near Paramaribo (MCZ). ECUADOR: *Rio Putumayo Drainage*—[Rio] Putumayo (Martens 1900: 655). *Rio Marañon Drainage*—Rio Napo, near Coca (MCZ); Rio Pastaza (type locality of *M. occidentalis)* (both Napo, Pastaza Prov.). PERU: Rio Huayabamba (trib.of Rio Huallaga), San Martin Prov. (type locality of *M. staudingeri)*; Rio Marañon, Loreto Prov. (CM). BOLIVIA: *Rio Madeira Drainage*—Rio Beni [near Rio Orton, Pando Prov.] (MCZ). BRAZIL: Rio Arguaia, Ilha do Bananal, Goiaz Prov. (type locality of *M. krausei)*; Rio Gurguéia, Bom Jesus, Piau Prov. (MCZ); Rio São Francisco, Casa Nova, Bahia Prov. (type locality of *M. bahia)*; Lagoa Salgado, Rio Salitre Drainage, Bahia Prov. (MCZ); Rio Peruaguacu *[sic]*, Engenho Ponte, Bahia Prov. (type locality of *A. siliquosus)*. *Rio Dos Sinos Drainage*: Rio Dos Sinos, 5 km W São Leopoldo (MCZ); Arroio da Mateiga, São Leopoldo (type locality of *M. legumen)* (both Rio Grande do Sul Prov.). URUGUAY: Canada Grande [Jaguarao], Dept. of Cerro Largo (type locality of *M. felipponei)*. RIO DE LA PLATA SYSTEM: *Rio Paraguay Drainage—Bolivia:* Rio de Tucabaca, near Mission San Juan (type locality of *M. ventricosus)*; [Rio Otuguis] Santa Ana de Chiquitos

(type locality of *M. weddellii)* (both Santa Cruz Prov.). *Rio Paraná Drainage—Argentina:* Laguna Guadaloupe, Santa Fe; Rio San Javier, Isla la Dionisia (both MCZ; both Santa Fe Prov.). *Rio Santiago Drainage—Argentina:* Rio Santiago, [a small river, near La Plata], Buenos Aires Prov. (MCZ).

## Bibliography


*Aguayo, C. G. 1959. Los origenes de la fauna Cubana. An. Acad. Cienc. Méd., Fís. y Nat., Habana *88:* 1-23.

Aguayo, C. G. and M. L. Jaume. 1947. Cat. Moluscos Cuba, no. 134, p. [1].

Bonetto, A. A. 1962. Especies del género *Mycetopoda* en el sistema hidrográfico del Rio de la Plata. Rev. Mus. Argentino Cienc. Nat. (Zool.) *8* (14): 173-182.

Burch, J. B. 1975. Freshwater Unionacean Clams (Mollusca: Pelecypoda) of North America. Malacological Publications, Hamburg, Michigan. xviii + 204 pp., text figs.

*Crosse, H. 1890. Faune malacologique terrestre et fluviatile de l'Ile de la Trinité (Antilles). Jour. de Conch. *38;* 35-65, pl. 2.

*_____ 1890. Faune malacologique terrestre et fluviatile de l'Ile de Cuba. Jour. de Conch. *38:* 173-335.

Guppy, R. J. L. 1866a. On the terrestrial and fluviatile Mollusca of Trinidad. Ann. Mag. Nat. Hist. (3) *17:* 42-56.

*_____ 1866b. Catalogue of the land and fresh water Mollusca of Trinidad. Proc. Sci. Assoc. Trinidad, pp. 2-27.

_____ 1893. The land and freshwater Mollusca of Trinidad. Jour. Conch. *7:* 210-231.

Haas, F. 1929. Bemerkungen über mittelamerikanische Najaden. Senckenbergiana *11:* 310-344, 21 figs.

_____ 1969. Superfamilia Unionacea. *[In]* Das Tierreich, Berlin. Leif. *88:* x + 663 pp.

Henderson, J. B. 1916. A list of the land and fresh-water shells of the Isle of Pines. Ann. Carnegie. Mus. *10* (3 and 4): 315-324.

Ihering, H. von. 1890. Revision der von Spix in Brasilien gesammelten Najaden. Arch. für Naturgesch., Berlin *1:* 117-170, pl. 9.

*_____ 1910. Über Brasilianische Najaden. Abh. Senckenb. Naturforsch. Ges. *32:* 113-140, pl. 12.

Johnson, R. I. 1971. The types and figured specimens of Unionacea (Mollusca: Bivalvia) in the British Museum (Natural History). Bull. British Mus. (Nat. Hist.), Zool. *20* (3): 75-108, pls. 1, 2.

Johnson, R. I. and H. B. Baker. 1973. The types of Unionacea (Mollusca: Bivalvia) in the Academy of Natural Sciences of Philadelphia. Proc. Acad. Nat. Sci. Philadelphia *125* (9): 145-186, 10 pls.

Liddle, R. A. 1928. The geology of Venezuela and Trinidad. J. P. MacGowan, Fort Worth, Texas, xxxix + 552 pp.

*Mansur, M. C. D. 1970. Lista dos moluscos bivalves das Famílias Hyriidae e Mycetopodidae para o Estado do Rio Grande do Sul. Iheringia [Mus. Rio-Grandense Ciênc. Nat., Porto Alegre], Sér. Zool., no. 39: 33-95.

MANSUR, M. C. D. AND I. L. VEITENHEIMER-MENDES. 1979. Redesacricao de *Mycetopoda legumen* (Martens, 1888) (Bivalvia, Mycetopodidae). Rev. Brasi de Biol. [Rio de Janeiro] *39* (3): 695–702, figs.

MARTENS, E. VON. 1900. Biologia Centrali-Americana. Land and freshwater mollusca. xxviii + 706 pp., 44 pls.

MAURY, C. J. 1925. A further contribution to the paleontology of Trinidad. Bull. American Paleontol. *10* (42): 153–402, pls. 1–40.

PALMER, K. VAN W. 1945. Fossil fresh-water Mollusca from the state of Monagas, Venezuela. Bull. American Paleontol. *31* (118): 1–34, 3 pls.

PARODIZ, J. J. AND A. A. BONETTO. 1963. Taxonomy and zoogeographic relationships of the South American naiades (Pelecypoda: Unionacea and Mutelacea). Malacologia *1* (2): 179–213.

ROSEN, D. E. 1976. A vicariance model of Caribbean biogeography. Syst. Zool. *24:* 431–464.

SIMPSON, C. T. 1914. A descriptive catalogue of the naiades, or pearly freshwater mussels, Detroit, Michigan, Parts 1–3: xi + 1540 pp.

VAUGHN, T. W. 1919. Contributions to the geology and paleontology of the West Indies. IV. Tertiary mollusks from the Leeward Islands and Cuba. Carnegie Institute, Washington, Pub. no. 291: 103–156, pls. 1–16.

VEITENHEIMER-MENDES, I. L. AND M. C. D. MANSUR. 1978a. Morfologia, histologia e ecologia de *Mycetopoda legumen* (Martens, 1888) (Bivalvia, Mycetopodae). Iheringia [Mus. Rio-Grandense Ciênc. Nat., Porto Alegre], Sér. Zool. no. 52: 33–71.

_____ 1978b. *Mycetopoda legumen* (Martens, 1888): Lasídio e Desenvolvimento Parasitário (Bivalvia, Mycetopodidae). Rev. Brasil Biol. [Rio de Janeiro]: *38* (3): 531–536.

*Relevant references not cited in text.